

What is claimed is:

1. A reflection-type color liquid crystal display apparatus comprising an active matrix substrate provided with a plurality of pixels each having a switching element and a reflection electrode in a matrix shape, a glass substrate having a transparent electrode, a liquid crystal layer arranged between the active matrix substrate and the glass substrate, a phase plate and a polarizing plate,

wherein for a normally black display system for displaying a black image on a lower voltage side of a voltage applied to the liquid crystal layer and displaying a white image at a certain voltage on a high voltage side, projections of Stokes parameter ( $S_1$ ,  $S_2$ ,  $S_3$ ) of light between the phase plate and the liquid crystal layer on an  $S_1 - S_2$  plane constitute a substantially linear line and polarized light at a reflecting plane of the reflection electrode is substantially circularly polarized light in any of wavelengths.

2. The reflection-type color liquid crystal display apparatus according to Claim 1, wherein retardation of the liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer falls in a range equal to or larger than 150 nm and equal

to or smaller than 340 nm and a twist angle of the liquid crystal layer falls in a range equal to or larger than 20 degrees and equal to or smaller than 70 degrees.

3. The reflection-type color liquid crystal display apparatus according to Claim 1, wherein retardation of the liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer falls in a range equal to or larger than 200 nm and equal to or smaller than 300 nm, a twist angle of the liquid crystal layer falls in a range equal to or larger than 40 degrees and equal to or smaller than 55 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of the glass substrate falls in a range equal to or larger than -32 degrees and equal to or smaller than -16 degrees, an azimuth angle of the phase plate which is an angle made by the transmission axis of the polarizing plate and a retarded phase axis of the phase plate falls in a range equal to or larger than 70 degrees and equal to or smaller than 81 degrees, and retardation of the phase plate falls in a range equal to or larger than 320 nm and equal to or smaller than 430 nm.

4. The reflection-type color liquid crystal display apparatus according to Claim 1, wherein retardation of the

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liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer is substantially 250 nm, a twist angle of the liquid crystal layer is substantially 50 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of the glass substrate is substantially -26 degrees, an azimuth angle of the phase plate which is an angle made by the transmission axis of the polarizing plate and a retarded phase axis of the phase plate is substantially 76 degrees, and retardation of the phase plate is substantially 380 nm.

5. The reflection-type color liquid crystal display apparatus according to Claim 1, further comprising a light source irradiating the reflection-type color liquid crystal display apparatus with three prime colors by switching the three prime colors on a time division basis to thereby display images in correspondence with the respective three prime colors in synchronism with switching timing of the light source on the time division basis.

6. A reflection-type color liquid crystal display apparatus comprising an active matrix substrate provided with a plurality of pixels each having a switching element and a reflection electrode in a matrix shape, a glass substrate having a transparent electrode, a liquid crystal

layer filled between the active matrix substrate and the glass substrate, a phase plate and a polarizing plate,

wherein for a normally white display system for displaying a white image on a lower voltage side of a voltage applied to the liquid crystal layer and displaying a black image at a certain voltage on a high voltage side, projections of Stokes parameter ( $S_1$ ,  $S_2$ ,  $S_3$ ) of light between the phase plate and the liquid crystal layer on an  $S_1 - S_2$  plane constitute a substantially linear line and polarized light at a reflecting plane of the reflection electrode is substantially linearly polarized light in any of wavelengths.

7. The reflection-type color liquid crystal display apparatus according to Claim 6, wherein retardation of the liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer falls in a range equal to or larger than 200 nm and equal to or smaller than 450 nm, a twist angle of the liquid crystal layer falls in a range equal to or larger than 50 degrees and equal to or smaller than 65 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of the active matrix substrate is substantially 0 degree or 90 degrees, an azimuth angle of the phase plate which is an

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angle made by the liquid crystal orientation direction on the side of the active matrix substrate and a retarded phase axis of the phase plate falls in a range equal to or larger than 44 degrees and equal to or smaller than 76 degrees, and retardation of the phase plate falls in a range equal to or larger than 69 nm and equal to or smaller than 255 nm.

8. The reflection-type color liquid crystal display apparatus according to Claim 6, wherein retardation of the liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer falls in a range equal to or larger than 250 nm and equal to or smaller than 450 nm, a twist angle of the liquid crystal layer falls in a range equal to or larger than 55 degrees and equal to or smaller than 60 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of the active matrix substrate is substantially 0 degree or 90 degrees, an azimuth angle of the phase plate which is an angle made by the liquid crystal orientation direction on the side of the active matrix substrate and a retarded phase axis of the phase plate falls in a range equal to or larger than 47 degrees and equal to or smaller than 75 degrees, and retardation of the phase plate falls in a

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range equal to or larger than 91 nm and equal to or smaller than 251 nm.

9. The reflection-type color liquid crystal display apparatus according to Claim 6, wherein retardation of the liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer is substantially 400 nm, a twist angle of the liquid crystal layer falls in a range equal to or larger than about 55 degrees and equal to or smaller than about 60 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of the active matrix substrate is substantially 0 degree or 90 degrees, an azimuth angle of the phase plate which is an angle made by the liquid crystal orientation direction on the side of the active matrix substrate and a retarded phase axis of the phase plate falls in a range equal to or larger than about 73 degrees and equal to or smaller than about 74 degrees, and retardation of the phase plate falls in a range equal to or larger than about 160 nm and equal to or smaller than about 200 nm.

10. The reflection-type color liquid crystal display apparatus according to Claim 6, further comprising a light source irradiating the reflection-type color liquid crystal display apparatus with three prime colors by switching the

three prime colors on a time division basis to thereby display images in correspondence with the respective three prime colors in synchronism with switching timing of the light source on the time division basis.

11. A reflection-type color liquid crystal display apparatus comprising an active matrix substrate provided with a plurality of pixels each having a switching element and a reflection electrode in a matrix shape, a glass substrate having a transparent electrode, a liquid crystal layer filled between the active matrix substrate and the glass substrate, a phase plate and a polarizing plate,

wherein for a normally white display system for displaying a black image on a lower voltage side of a voltage applied to the liquid crystal layer and displaying a white image at a certain voltage on a high voltage side, retardation of a liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer falls in a range equal to or larger than 200 nm and equal to or smaller than 450 nm, a twist angle of the liquid crystal layer falls in a range equal to or larger than 50 degrees and equal to or smaller than 65 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of the active matrix substrate is substantially 0

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degree or 90 degrees, an azimuth angle of the phase plate which is an angle made by the liquid crystal orientation direction on the side of the active matrix substrate and a retarded phase axis of the phase plate falls in a range equal to or larger than 44 degrees and equal to or smaller than 76 degrees, and retardation of the phase plate falls in a range equal to or larger than 69 nm and equal to or smaller than 255 nm.

12. The reflection-type color liquid crystal display apparatus according to Claim 11, further comprising a light source irradiating the reflection-type color liquid crystal display apparatus with three prime colors by switching the three prime colors on a time division basis to thereby display images in correspondence with the respective three prime colors in synchronism with switching timing of the light source on the time division basis.

13. A reflection type liquid crystal display apparatus of a normally black display system, comprising:

a pair of substrates and a liquid crystal layer sandwiched between the pair of substrates;

wherein a transparent electrode is arranged on one substrate of the pair of substrates;

wherein a plurality of pixels each having a switching element and a reflection electrode are arranged



on other substrate of the pair of substrates; and

wherein a phase plate and a polarizing plate are arranged on a side of the one substrate provided with the transparent electrode;

characterized in that

projections of Stokes parameter ( $S_1$ ,  $S_2$ ,  $S_3$ ) of light between the phase plate and the liquid crystal layer on an  $S_1 - S_2$  plane constitute a substantially linear line; and

that polarized light at a reflecting plane of the reflection electrode is substantially circularly polarized light in any of wavelengths.

14. The reflection type liquid crystal display apparatus of a normally black display system according to Claim 13,

wherein retardation of the liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer falls in a range equal to or larger than 150 nm and equal to or smaller than 340 nm; and

wherein a twist angle of the liquid crystal layer falls in a range equal to or larger than 20 degrees and equal to or smaller than 70 degrees.

15. The reflection type liquid crystal display apparatus of a normally black display system according to

Claim 13,

wherein retardation of the liquid crystal layer which is a product of a thickness and refractive index anisotropy of the liquid crystal layer falls in a range equal to or larger than 200 nm and equal to or smaller than 300 nm; and

wherein a twist angle of the liquid crystal layer falls in a range equal to or larger than 40 degrees and equal to or smaller than 55 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of the glass substrate falls in a range equal to or larger than -32 degrees and equal to or smaller than -16 degrees, an azimuth angle of the phase plate which is an angle made by the transmission axis of the polarizing plate and a retarded phase axis of the phase plate falls in a range equal to or larger than 70 degrees and equal to or smaller than 81 degrees, and retardation of the phase plate falls in a range equal to or larger than 320 nm and equal to or smaller than 430 nm.

16. The reflection type liquid crystal display apparatus of a normally black display system according to Claim 13,

wherein retardation of the liquid crystal layer

which is a product of a thickness and refractive index anisotropy of the liquid crystal layer is substantially 250 nm, a twist angle of the liquid crystal layer is substantially 50 degrees, an angle made by a transmission axis of the polarizing plate and a liquid crystal orientation direction on a side of a glass substrate is substantially -26 degrees, an azimuth angle of the phase plate which is an angle made by the transmission axis of the polarizing plate and a retarded phase axis of the phase plate is substantially 76 degrees, and retardation of the phase plate is substantially 380 nm.

17. The reflection-type color liquid crystal display apparatus according to Claim 13, further comprising a light source irradiating the reflection-type color liquid crystal display apparatus with three prime colors by switching the three prime colors on a time division basis to thereby display images in correspondence with the respective three prime colors in synchronism with switching timing of the light source on the time division basis.

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